Description and Evaluation of Table Grape Cultivars Cultivated in Jabal Alkhdar – Libya

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ABSTRACT: This investigation was conducted for two successive seasons (2014 and 2015) for description and evaluation of eleven table grape cultivars namely: Alponse Lavalle, Cardinal, Chasselas, Danlas, Dattier de Beyraouth, Flame Seedless, Italia, Muscat of Alexandria, Muscat Hambourg, Ribol and Sultanine. The chosen vines were grown in a heavy clay soil, under rain fed conditions in Messa region, Elbida-Libya. Some phenological aspects, description studies including (growing tips, leaves, bunches and berries), and chemical studies of bunches and berries were carried out. The results showed that the phenological cycle from budburst to beginning of ripening occurred within a frame time of 92 days (Cardinal) to (132) days (Sultanine), whereas the interval between start of blooming and start of maturity ranged from 57 and 92 days for Cardinal and Muscat de Hambourg cultivars, respectively. Cultivars under study were divided into three categories from the view point of maturity: (1) Very early cultivars (27/6 to 10/7): Cardinal, Flame Seedless; (2) Early cultivars (12/7 to 28/7): Alphonse Lavalle, Ribol, Danlas and (3) Medium mature cultivars (2/8 to 7/8): Sultanine, Muscat of Alexandria, Muscat Hamburg, Dattier De Beyrouth, Chasselas, Italia. All studied cultivars were characterized by good vegetative growth and bunch quality. Concerning berry shape and size, Sultanine cultivar had very small berries; Alphonse Lavalle, Chasselas, Flame Seedless cultivars had small size berries; Danlas, Dattier de Beyrouth, Italia, Muscat of Alexandria**,** Ribol and Muscat Hambourg cultivars had medium size berries and Cardinal cultivar had large size berries. As for the berry shape, all cultivars had spherical shape except Dattier de Beyrouth, Italia, Muscat of Alexandria, Ribol and Sultanine cultivars had oval shape berries. Concerning berry color, it is clear that in all cultivars it was yellow except Cardinal, Flame Seedless, Grenache and Ribol cultivars had red color berries. These cultivars characterized by small bunches, where bunch weight ranged from 157 g (Chasselas) and 261 g (Danlas). The average weight of 100 berries of these cultivars ranged from 112 g (Sultanine) to 612 g (Cardinal); Concerning of fruit taste and aroma, the following cultivars had good taste and strong aroma (Italia, Muscat of Alexandria, Muscat Hambourg). The total sugars ranged from 16.28% (Sultanine) and 18.8% (Italia). Monosaccharides ranged from 13.48% (Danlas) to 17.65% (Sultanine). In general, the results showed that these different grapevine cultivars offer satisfactory and typical phenological characteristics during growth and at maturity, in relation to the classical table cultivars growing regions of the world, showing a good adaptation to the cultivation location, Massa Elbeda, Libya.

Keywords: Grape cultivars, morphology & phenology, Jabal Alkhdar.

Abbreviations: S = small, VS = very small, M = medium, L=large. Cy = cylindrical, CO = conical, LCO = long conical, COS = conical with shoulders. 2 = loose. 4 = compact, 3 = medium compact. SP = spherical, O = oval; - B = black, BB = blue-black, BR = brown, GR = grey, R = red, DR = dark red, Y = yellow, LY = light yellow, GY = green yellow, RG = reddish green, G = green, W = white, MTK = medium thick, TK = thick, TH = thin. SH = short, VSH = very short, M = medium. F = fleshy, J = juicy, Cr = crispy. P = present, A = absent. P = pentagonal, C= circular, Br = bristle, Co = cottony, S = spidery, D = deep, HD = half deep, SH = shallow, O = open, WO = wide open, DO = deep open, CL = closed, SM = smooth, R = rough, Bl = blister

INTRODUCTION

Grape is considered as one of the most important fruit crops in the world. In Libya, grape occupies the fourth rank after citrus, olives and dates. The total grape production in Libya during 2009 was 130000 tons according to the statistics of Ministry of Agriculture (2009). In 1981 Ministry of Agriculture

through the Agriculture Development system introduced some new table & wine grape cultivars which have been planted in different growing regions in Libya; these cultivars were found to have different morphological characteristics and bunch quality.

Cultivars can be characterized by several methods: (1) Morphological description of parts of the plants (shoots, leaves, bunches, berries, etc.) at different phenological stages (Olv, 1984), (2) Morphometry based on measurement parameters of plant organs and phenological dates, i.e. dates of budburst and harvesting (Galet, 1952; Cabello *et al*.,1993) and (3) Analysis of biochemical compounds either quantitatively or qualitatively. These examinations of some grapevine parameters remain the most important and easiest means for the identification of grape species, varieties and clones (Schneider, 1996).

Climate is the most significant factor in determining grape's inherent qualities (Fraga *et al*., 2016). Each grape species has a uniquely preferred environment for ideal growing. Because climates vary from country to country, selecting the best strain is an important decision in grape cultivation. In addition, because climatic factors such as temperature and rain can be unpredictable and uncontrollable, each year will produce unique qualities and yields of grapes. Pervious trials dealt with the description and evaluation of grape cultivars (Olmo, 1946; Kamel, 1964; Winkler *et al*., 1965; Brooks and Olmo, 1972; Bacha *et a*l., 1982; Deer *et al*., 1989; Watt, 1983; Walker and Boursiquote, 1992; Abd El-Kawi and El-Yam, 1992 a and b; Abd El-Fatah and Kastor, 1993 a and b; Morrison, 1994; Tourky *et al*., 1995; El Sharkawy 1995; Fawzy 1998; Aisha *et al*., 1998; Marwad, 2002 a and b; Gaser, 2006; Girgis, 2007; Al-Yami 2008; Sabry *et al*., 2009; and Abd EL-Wahab, 2011).

The goal of this study was to describe and evaluate eleven table grape cultivars, five cultivars (Alponse Lavalle, Chasselas, Danlas, Dattier de Beyraouth and Ribol) imported from France, two cultivars (Cardinal and Flame seedless) from America and one cultivar (Italia) from Italy, (Muscat of Alexandria) from South Africa, (Muscat Hambourg) from Britain, and (Sultanine) from Minor Asia, cultivated under Libyan conditions, in Messa region, Elbida, Aljabal Alkhdar, with special stress on some characteristics which may serve in distinguishing these cultivars.

MATERIALS AND METHODS

The present study was carried in 2014 and 2015 seasons on eleven table grave cultivars shown in Table (1). Vines were grown in Messa region, Elbida-Libya.

The studied area is located in the northeastern part of Libya, bounded from the north, Mediterranean Sea and latitude 33º N, and Elbeda city from east and latitude 25º and Suluq city from west and longitude 15º 20´ E. The length of this area estimated by 650 km. The study area (Massa) is considered as the center of Jabal Alkhdar area, where it is located 20 km from Mediterranean sea and at altitude of 490 meters above sea level. The rainy season starts in November and ends in May. The rate of annual rainfall in this area is about 500

mm., and this varies from year to year. Massa area enjoys a Mediterranean climate, which is characterized by a cold rainy winter, and relatively hot dry summer and temperate spring and autumn. The average annual temperature is about (18°C), where July is the warmest month of the year with an average temperature around the (26°C), while January is the coldest month of the year, where the average temperature is reduced to 10°C. The rate of relative humidity in this area is about (60%), it reaches (75%) in January and (51%) in June. The texture of soil is heavy clay and characterized by reddish-brown color. The pH is slightly alkaline ranging from 7.5 – 8. Organic matter % is about 2% and the cation exchange capacity of this soil is high (15-30 meq/100g). Sometimes hardpan patches at 35 cm depth from soil surface are found.

Table (1). Table grape cultivars

No.	Cultivar name	Source
1	Alponse Lavalle	France
2	Cardinal	America
3	Chasselas	France
4	Danlas	France
5	Dattier de Beyraouth	France
6	Flame seedless	America
7	Italia	Italy
8	Muscat of Alexandria	South Africa
9	Muscat Hambourg	Britain
10	Ribol	France
11	Sultanine	Minor Asia

Five uniform vines of each cultivar were selected for this study. These vines were arranged in completely randomized design and each vine represented one replicate. For vegetative description, color of growing tips, shoots and leaves in addition to the presence of leaf hairs were observed on vines of the studied varieties. Ten mature leaves from each vine for the different varieties were collected to study leaf and petiole morphological characteristics. At harvest five clusters were harvested from each vine of the studied varieties to study cluster and berry characteristics. Fruit chemical characteristics were studies on 100 berries from each replicate (AOAC, 1980). Also, pheno-physiological characters; sap flow, bud burst, blooming, fruit set and start of maturity dates were recorded for the studied cultivars. Sap flow was estimated with the “stem heat balance” method (Sakuratani, 1981; Baker et al., 1987; Steinberg et al., 1990). Description of grapevines under study was done according to the descriptors of grapevine issued by the International Plant Genetic Resources Institute (IPGRI, 1983).

RESULTS AND DISCUSSIONS

I. Descriptive measurements

Data concerning the evaluation and the morphological description of the studied cultivars are presented in Tables (2a and 2b).

(a) New vegetative growth:

- Growing tip color: Chasselas, Flame Seedless, Danlas, Muscat de Alexandria, Dattier de Beyrouth, & Sultanine cultivars had green color, while Muscat de Hambourg, Alphonse Lavalle, Cardinal, Italia, & Ribol cultivars had reddish green color.

- Shoot color: All cultivars had green color.

- New leaf color: All cultivars had green color.

- New Leaf Hairs: Alphonse Lavalle & Muscat de Alexandria cultivars had cottony hairs, whereas Chasselas, Italia, & Muscat de Hambourg cultivars had spidery hairs. Cardinal, Danlas, Dattier de Beyrouth, Flame Seedless, Ribol, & Sultanine cultivars had no hairs.

The present results are in harmony with Ates et al., (2011) and Carka *et al.* (2015), on some grape cultivars.

(b) Mature leaf:

Definition relevant to mature leaves have been generally approved as powerful way of identifying genotypes (Kara,1990; Ortiz *et al*., 2004; and Satiago *et al*., 2007).

- Leaf shape: The following cultivars: Alphonse Lavalle, Dattier de Beyrouth, Flame Seedless, Muscat de Hambourg, and Ribol had pentagonal leaf shape, whereas Cardinal, Chasselas, Danlas, Italia, Muscat de Alexandria, & Sultanine cultivars had circular leaf shape.

- Leaf size: All cultivars had a large leaf size except Alphonse Lavalle, Carignan, Muscat Petitgrain cultivars which had medium leaf size.

- Leaf hairs: The cultivar Alphonse Lavalle had cottony hairs, whereas Cardinal, Italia, and Muscat Hambourg cultivars had spidery hairs and Muscat of Alexandria had bristle hairs. Chasselas, Danlas, Dattier de Beyrouth, Flame Seedless, Ribol, and Sultanine cultivars had no leaf hairs.

- Leaf lobes: Number of leaf lobes in all cultivars under studied was five.

- Lobes depth: With regard to depth of lobes, it was noticed that all cultivars were half deep except Danlas, Flame seedless, cultivars were deep.

- Leaf texture: Danlas, Dattier de Beyrouth, Flame Seedless, Italia, Ribol, and Sultanine cultivars showed smooth leaf surface, whereas Alphonse Lavalle, Cardinal, Muscat de Alexandria, and Muscat Hambourg cultivars showed rough leaf surface and Chasselas cultivar had blister leaf surface.

- Petiole length: Alphonse Lavalle, Dattier de Beyrouth, Flame Seedless, Ribol, and Sultanine cultivars had very short petiole, whereas Cardinal, Chasselas, Italia, Muscat de Alexandria, and Muscat de Hambourg cultivars had short petiole and Danlas cultivar had medium petiole.

- Petiole sinus: It was found that Flame Seedless cultivars had wide open sinus while Alphonse Lavalle, Muscat of Alexandria, Ribol, and Muscat Hambourg cultivars had deep open sinus and Cardinal, Italia, Chasselas, Danlas, Dattier de Beyrouth, and Sultanine cultivars had closed sinus. From the above-mentioned data, it is clear that leaf characters were more valuable in the identification and taxonomy of the tested varieties. Some studies on different cultivars are in line with the above-mentioned results Gaser *et al*.(1998), Gaser (2006) and Rusjan *et al*. (2015).

Table (2a). New vegetative growth characterization

Cultivars	Growing tip color	New leaf		Twigs color
		Color	Hairs	
Alponse Lavalle	RG	G	Co	G
Cardinal	RG	G	A	G
Chasselas	G	G	S	G
Danlas	G	G	A	G
Dattier de Beyraouth	G	G	A	G
Flame seedless	G	G	A	G
Italia	RG	G	S	G
Muscat of Alexandria	RG	G	S	G
Muscat Hambourg	G	G	Co	G
Ribol	RG	G	A	G
Sultanine	G	G	A	G

Table (2b). Mature leaf characterization

Cultivars	Leaf				Lobes		Petiole	
	Shape	Size	Hairs	Texture	Number	Depth	sinus	length
Alponse Lavalle	P	M	C	R	5	HD	DO	VSH
Cardinal	C	L	S	R	5	HD	CL	SH
Chasselas	C	L	A	BL	5	HD	CL	SH
Danlas	C	L	A	SM	5	D	CL	M
Dattier de Beyraouth	P	L	A	SM	5	HD	CL	VSH
Flame seedless	P	L	A	SM	5	D	WO	VSH
Italia	C	L	S	SM	5	HD	CL	SH
Muscat of Alexandria	C	L	Br	R	5	HD	DO	SH
Muscat Hambourg	P	L	S	R	5	HD	DO	SH
Ribol	P	L	A	SM	5	HD	DO	VSH
Sultanine	C	L	A	SM	5	HD	CL	VSH

(c) Bunch characteristics

- Bunch shape: It was noticed that the following cultivars: Alphonse Lavalle, Dattier de Beyrouth, Muscat of Alexandria, and Muscat Hambourg had conical shape bunch while Flame Seedless, Italia, Ribol, and Sultanine cultivars had long conical bunch and Danlas cultivar has conical bunch with shoulders and Cardinal and Chasselas cultivars had cylindrical bunch.

- Bunch compactness: Concerning bunch compactness there were significant differences among the grape cultivars under study, where Cardinal, Muscat Hambourg and Ribol cultivars characterized by loose bunches; Chasselas, Dattier de Beyrouth, Muscat of Alexandria and Sultanine cultivars had medium

compact bunches; Alphonse Lavalle, Danlas, Flame Seedless and Italia, had compact bunches. The result in this respect is agreed with many investigators worked on different cultivars (Aisha *et al*., 1998; Marwad, 2002 a and b).

- Bunch length: With regard to bunch length, the results in Table (3) showed significant differences among the grape varieties, where Sultanine, Flame seedless and Dattier de Beyrouth cultivars showed the highest values, 28, 24, and 23 cm., respectively; while Chasselas, Muscat of Alexandria and Cardinal cultivars showed the lowest values, 16, 17, and 18 cm, respectively. Total bunch length (Bunch length + Peduncle length) for the studied cultivars ranged from 18 cm (Chasselas) to 30 cm (Sultanine).

- Bunch width: Bunch width ranged from 7 cm (Dattier de Beyrouth) to 12 cm (Flame seedless).

- Peduncle length: With regard to peduncle of bunches, it was found that in all studied cultivars the peduncle length ranged from 1 cm (Muscat de Hambourg) to 4 cm (Dattier de Beyrouth)

- Bunch weight: Data showed that the grape cultivars characterized by small bunches, where bunch weight ranged from 157 g (Chasselas) and 261 g (Danlas). (Table 3, Fig. 1.)

In this respect, Bessins (1965) stated that fruitfulness of grapevine buds proceeded progressively from the basal buds till the middle of the fruiting cane then declined towards the tip. Also, (Monastra, 1971) found that fertility of buds increased from the base of the cane to the 10th node, thereafter it fell slightly towards the tip. Abdel-Kawi and El-Yami (1992), Gaser et al.;(1998) Gaser (2006) found that fruitfulness of buds successively increased in general from the basal to the distal buds of the canes.

Table (3). Bunch characterizations of grape cultivars

Cultivars	size	Shape	Weight (g)	Length (cm)	Width (cm)	Bunch length (cm)	Bunch compactness
Alponse Lavalle	S	CO	207	19	10	22	4
Cardinal	S	CY	227	18	11	26	2
Chasselas	S	CY	157	16	9	18	3
Danlas	M	COS	261	20	10	27	4
Dattier de Beyraouth	S	CO	200	23	7	27	3
Flame seedless	M	LCO	233	24	12	27	4
Italia	M	LCO	250	21	10	24	4
Muscat ofAlexandria	S	CO	186	17	9	19	3
Muscat Hambourg	S	CO	168	19	10	20	2
Ribol	M	LCO	238	20	11	25	2
Sultanine	M	LCO	258	28	10	30	3
Mean ± SD			**217.0 ± 35.52**	**20.45 ± 3.45**	**9.9 ± 1.3**	**24.09 ± 3.85**	**3.09 ± 0.83**

(d) Berry characteristics

- Berry shape: Alphonse Lavalle, Cardinal, Chasselas, Danlas, Flame Seedless, and Muscat Hambourg cultivars had spherical shape, whereas Dattier de Beyrouth, Italia, Muscat of Alexandria**,** Ribol, and Sultanine cultivars had oval shape.

- Berry size: Sultanine cultivar characterized by very small berry size, whereas Alphonse Lavalle, Chasselas, and Flame Seedless cultivars had small berry size and Danlas, Dattier de Beyrouth, Italia, Muscat of Alexandria**,** Ribol, and Muscat Hambourg cultivars characterized by medium berry size. Cardinal cultivar had large berry size comparing with other cultivars.

- Berry color: Concerning berry color, it is clear that in Alphonse Lavalle cultivar it was blue black, black in Muscat Hambourg cultivar, red in Cardinal and Flame Seedless cultivars, dark red in Ribol cultivar, yellow in Danlas, Dattier de Beyrouth, Muscat of Alexandria and Sultanine cultivars, light yellow in Chasselas cultivar and green yellow in Italia cultivar.

- Berry thickness: Concerning berry thickness, it is clear that in Chasselas, Flame Seedless, Danlas, and Muscat of Alexandria cultivars it was thin, medium thick in Alphonse Lavalle, Dattier de Beyrouth, Muscat Hambourg, Ribol, and Sultanine cultivar and thick in Italia and Cardinal cultivars.

- Berry pedicel: With regard to berry thickness, it is clear that in Chasselas, Flame Seedless, Danlas, Muscat of Alexandria, Ribol, and Sultanine cultivars it was very short, short in Alphonse Lavalle, Cardinal, Dattier de Beyrouth, and Muscat Hambourg cultivars and medium in Italia cultivar.

- Flesh color: Cardinal, Chasselas, Danlas, Flame seedless, Italia, Muscat of Alexandria, Ribol, and Sultanine cultivars had white flesh color, whereas Alphonse Lavelle and Muscat Hambourg cultivars had green flesh color and Dattier de Beyrouth cultivar had yellow flesh color

- Flesh texture: Chasselas, Danlas, Dattier de Beyrouth, Italia, Muscat of Alexandria, Ribol and Sultanine cultivars showed fleshy texture, whereas Alphonse Lavalle, Cardinal and Flame seedless cultivars showed crispy texture and Muscat Hambourg cultivar showed juicy texture,

- Presence of seeds: Seeded cultivars with 2 seeds per berry were (Alphonse Lavalle, Cardinal, Danlas, Dattier de Beyrouth, Italia, Muscat Hambourg, Ribol), 2-3 seeds (Chasselas), 3-4 seeds (Muscat of Alexandria). Seeds color was brown for most cultivars except Dattier de Beyrouth and Italia where their color was grey. Seedless cultivars were: Flame Seedless and Sultanine.

- Berry length: Ranged from 14 mm (Flame seedless, Sultanine) to 23 mm (Italia).

- Berry diameter: Ranged from 12 mm (Sultanine) to 22 mm (Cardinal).

- Berry weight: Average berry weight ranged from 1-2 g in the following cultivars: Sutanine, Chasselas, Flame seedless, therefore these cultivars can be considered with small berries (less than 2 g), while berry weight of following cultivars: Danlas, Muscat Hambourg, Dattier de Beyraouth, Muscat of Alexandria and Ribol ranged from 3- 4 g, therefore they considered as intermediate berry. The berry weight of the following cultivars: Cardinal, Alphonse Lavalee, & Italia, ranged from 5-6 g, therefore they considered as large berry. The average weight of 100 berries of these cultivars ranged from 112 g (Sultanine) to 612 g (Cardinal). (Tables 4 and 5, Fig. 2.)

Concerning fruit taste and aroma, the following varieties had good taste and strong aroma; Italia, Muscat of Alexandria, Muscat Hambourg. The results in this respect are in line with those of many investigators working on different cultivars (Ismail, 1989, Tourky *et al*., 1995; Fawzy, 1998; Aisha *et al*., 1998 and Marawad, 2002 a and b).

Table (4). Berry characterizations of grape cultivars

Cultivars	Berry					Flesh		Seeds		
	Shape	Size	Color	Thickness	Pedicel	Color	Texture	Presence	No.	Color
Alponse Lavalle	SP	S	BB	MTK	SH	G	Cr	P	2	BR
Cardinal	SP	L	R	TK	SH	W	Cr	P	2	BR
Chasselas	SP	S	LY	TH	VSH	W	F	P	2-3	BR
Danlas	SP	M	Y	TH	VSH	W	F	P	2	BR
Dattier de Beyraouth	O	M	Y	MTK	SH	Y	F	P	2	GR
Flame seedless	SP	S	R	TH	VSH	W	Cr	A	-	-
Italia	O	M	GY	TK	M	W	F	P	2	GR
Muscat of Alexandria	O	M	Y	TH	VSH	W	F	P	3-4	BR
Muscat Hambourg	SP	M	B	MTK	SH	G	J	P	2	BR
Ribol	O	M	DR	MTK	VSH	W	F	P	2	BR
Sultanine	O	VS	Y	MTK	VSH	W	F	A	-	-

Table (5). Berry's length, diameter and weight

Cultivars	Length (mm)	Diameter (mm)	Weight (g)	Av. wt. of 100 berries (g)
Alponse Lavalle	22	20	5	478
Cardinal	22	22	6	612
Chasselas	15	15	2	203
Danlas	18	18	3	318
Dattier de Beyraouth	22	19	4	362
Flame seedless	14	14	2	145
Italia	23	18	5	504
Muscat of Alexandria	19	17	4	371
Muscat Hambourg	16	16	3	263
Ribol	21	19	4	347
Sultanine	14	12	1	112
Mean ± SD	**18.72 ± 3.49**	**17.27 ± 2.87**	**3.54 ± 1.51**	**337.72 ± 153.8**

(e) Berry chemical parameters

The results in Table (6), showed the mean values of dry matter (%), total dissolved solids (TDS) (%), total titratable acidity (TA) (%), and sugars (%).

Percent dry matter for these cultivars ranged from 18.98% (Ribol) to 21.1% (Italia). Danlas cultivar was characterized by its low TDS values (15.8%).

Percent acidity for these cultivars ranged from 0.22% (Dattier de Beyrouth) to 0.40% (Cardinal). Differences in the acidity of the table grape at harvest can be due to differences among cultivars, environmental conditions, storage time, and other factors. The total sugars ranged from 16.28% (Danlas) and 18.8% (Italia). Monosaccharides ranged from 13.48% (Danlas) to 17.65% (Sultanine).

Table (6). Chemical analysis of berries juice

Cultivars	Dry matter %	TDS %	Acidity %	% Sugars	
				Total	Mono
Alponse Lavalle	19.70	17.80	0.26	17.39	15.48
Cardinal	20.20	18.70	0.40	17.50	16.30
Chasselas	20.10	19.00	0.30	18.40	16.55
Danlas	19.40	15.80	0.28	16.28	13.48
Dattier de Beyraouth	19.70	18.16	0.22	17.92	15.75
Flame seedless	20.30	18.80	0.24	17.80	16.40
Italia	21.10	19.41	0.30	18.80	16.96
Muscat of Alexandria	19.51	17.51	0.35	16.54	14.51
Muscat Hambourg	20.50	18.90	0.25	17.80	16.48
Ribol	18.98	16.96	0.29	16.30	14.55
Sultanine	21.05	19.86	0.33	18.20	17.65
Mean ± SD	**20.05 ± 0.67**	**18.26 ± 1.18**	**0.29 ± 0.05**	**17.53 ± 0.85**	**15.83 ± 1.23**

II. Pheno-physiological characters

Sap flow for these cultivars started form March 17 (Flame seedless) to March 25 (Muscat Alexandria), the period of sap flow was 8 days. The budburst period began from March 21 (Flame seedless) to April 13 (Muscat of Alexandria). The interval between budburst and start of maturity of these cultivars ranged from (92) days (Cardinal) to (132) days (Sultanine) (Fig. 5). The budburst of table grape cultivars started from March 21 (Flame seedless) to April 13 (Muscat of Alexandria) for season 2014, whereas budburst started from March 16 (Flame seedless) to April 15 (Italia) for season 2015.

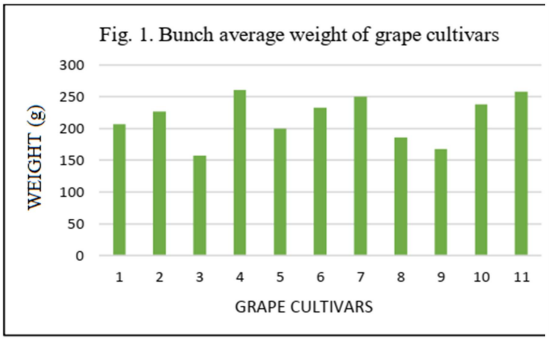
The blooming time of these varieties occurred between May 03 (Muscat Hambourg) to May 09 (Cardinal) and ends between May 10 (Muscat Hambourg) to May 16 (Alphonse Lavalle, Cardinal, Dattier de Beyrouth, Italia, Sultanine). The interval between start of blooming and start of maturity of these cultivars ranged from 57 and 92 days for Cardinal and Muscat Hambourg cultivars, respectively (Fig. 4).

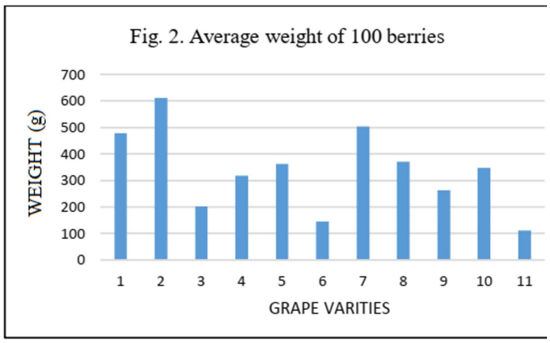
Fruit set started from May 07 (Muscat Hambourg) to May 14 (Cardinal) and ended between May 14 (Muscat Hambourg) to May 23 (Dattier de Beyraouth). The number of days between start and end of fruit set ranged from 5 to 19 days.

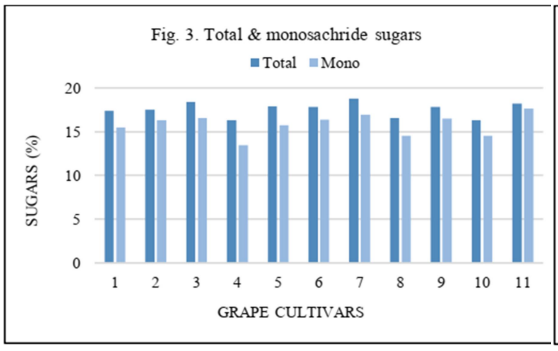
Maturity of grape cultivars can be divided into 3 groups: (1) Very early mature varieties (2/7 to 6/7): Cardinal, Flame seedless. (2) Early mature varieties (12/7 to 25/7): Alphonse Lavale, Ribol, Danlas, (3) Medium mature varieties (3/8 to 7/8): Sultanine, Muscat of Alexandria, Italia, Chasselas, Muscat Hambourg, Dattier de Beyrouth.

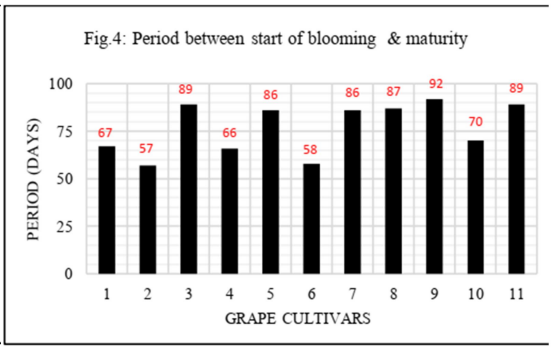
Table (7). Phenological stages of grape cultivars under study during seasons 2014 and 2015

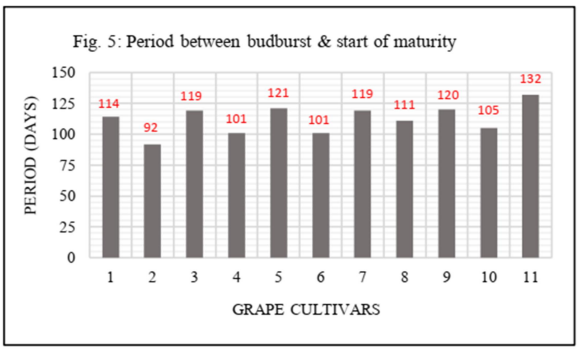
Cultivars	Sap flow date	Bud burst		Blooming		Fruit set		Start of maturity	
		2014	2015	2014	2015	2014	2015	2014	2015
Alponse Lavalle	March 22	April 3-8	April 13-18	May 7-12	May 1-6	May 13-18	May 8-12	July 25	July 20
Cardinal	March 23	April 3-8	April 13-18	May 9-13	May 4-10	May 14-20	May 9-14	July 06	July 01
Chasselas	March 22	April 6-11	April 11-16	May 6-11	May 1-6	May 12-19	May 8-14	Aug 05	Aug 01
Danlas	March 21	April 1-5	March 25-30	May 6-10	May 1-6	May 11-19	May 6-14	July 12	July 07
Dattier de Beyraouth	March 21	April 3-8	March 28-30	May 8-12	May 2-8	May 11-23	May 7-18	Aug 04	Aug 01
Flame seedless	March 17	March 21-26	March 16-20	May 7-12	May 1-6	May 13-21	May 8-16	July 02	July 23
Italia	March 22	April 4-10	April 15-20	May 7-12	May 3-8	May 13-20	May 8-16	July 03	July 01
Muscat of Alexandria	March 25	April 13-18	April 8-13	May 8-12	May 3-9	May 13-19	May 6-14	July 03	July 01
Muscat Hambourg	March 22	April 6-11	April 1-6	May 3-11	May 1-6	May 7-14	May 2-9	Aug 06	Aug 06
Ribol	March 22	April 1-6	April 1-6	May 6-12	May 2-9	May 11-19	May 6-9	July 16	July 10
Sultanine	March 21	March 25-30	March 20-25	May 8-12	May 2-9	May 13-20	May 6-9	Aug 07	July 07











CONCLUSIONS

In general, the results showed that these different grapevine cultivars offer satisfactory and typical phenological characteristics during growth and at maturity, in relation to the classical table varieties growing regions of the world, showing a good adaptation to the cultivation location, Massa Elbeda, Libya.

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الملخص العربي

وصف وتقييم أصناف عنب المائدة المزروعة في منطقة (مسه) الجبل الأخضر

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باحث – وحدة بحوث البستنة – مركز البحوث الزراعية والحيوانية – البيضاء – ليبيا

تم إجراء هذه الدراسة لموسمين متتاليين (٢٠١٤/٢٠١٥) لوصف وتقييم إحدى عشر صنفاً من عنب المائدة وهي : Alponse Lavalle ، Cardinal ، Chasselas ، Danlas ، Dattier de Beyraouth ، Flame seedless ، Italia ، Muscat of Alexandria ، Muscat Hambourg ، Ribol ، Sultanine . هذه الأصناف مزروعة في تربة طينية ثقيلة ، تحت ظروف الأمطار في منطقة مسة – البيضاء – ليبيا. . درست بعض الجوانب الفينولوجية والمورفولوجية بما في ذلك (النموات الجديدة ، الأوراق حديث النمو والناضجة ، العناقيد ، الثمار) ، والخصائص الكيميائية لعصيرالثمار. وأظهرت النتائج أن الدورة الفينولوجية من تفتح البراعم إلى بداية النضج وقعت خلال فترة تراوحت ما بين ٩٢ يوماً (في الصنف كاردينال Cardinal إلى ١٣٢ يوماً (في الصنف سلطانين Sultanine) ، بينما تراوحت الفترة من بداية التزهير وبدء النضج لهذه الأصناف من 57 يوماً (في الصنف كاردينال Cardinal إلى ٩٢ يوماً (في الصنف Muscat Hambourg . قسمت الأصناف تحت الدراسة إلى ثلاث فئات من حيث موعد النضج: (١) أصناف مبكرة جدا (٦/٢٧ إلى ٧/١٠) مثل : Cardinal ، Flame seedless ، (٢) أصناف مبكرة النضج (٧/١٢ إلى ٧/٢٨) مثل: Danlas ، Alponse Lavalle ، Ribol ، (٣) أصناف متوسطة النضج (٨/٢ إلى ٨/٧) مثل: Sultanine ، Muscat of Alexandria ، Muscat Hambourg ، Dattier De Beyrouth ، Chasselas ، Italia . وقد تميزت جميع الأصناف المدروسة بالنمو الخضري الجيد وجودة العناقيد. أما بالنسبة لوزن وحجم الثمار، فإن الصنف سلطانين Sultanine يتميز بحجم ثمار ضغيرة جدا، بينما الأصناف Alphonse Lavalle ، Chasselas ، Flame Seedless ، فكان حجم ثمارها صغير في حين أن الأصناف Danlas ، Dattier de Beyrouth ، Italia ، Muscat de Alexandria ، Ribol ، Muscat de Hambourg فكانت ثمارها متوسطة الحجم ، وتميز الصنف كاردينال Cardinal بثمار كبيرة الحجم. أما بالنسبة لشكل الثمار، فقد كان لجميع الأصناف شكل كروي ما عدا الأصناف ، Dattier de Beyrouth ، Italia ، Muscat Alexandria ، Ribol ، Sultanine فقد كانت ثمارها بيضاوية الشكل. أما فيما يتعلق بلون الثمار، فمن الواضح أن لون ثمار جميع الأصناف كان أصفر بإستثناء الأصناف Cardinal ، Flame seedless ، Grenache ، Ribol فكان لون ثمارها أحمر. أظهرت النتائج أيضا ، أن هذه الأ صناف تتميز بعناقيد صغيرة حيث تراوح متوسط وزن العنقود من ١٥٧ جم للصنف Chasselas إلى ٢٦١ جم لصنف Danlas . تراوح متوسط وزن ١٠٠ ثمرة من هذه الأصناف ما بين ١١٢ جم للصنف Sultanine إلى ٦١٢ جم للصنف Cardinal . أما فيما يتعلق بالطعم والرائحة فإن الأصناف التالية لها طعم جيد ورائحة قوية Muscat of Alexandria Muscat Hambourg ، Italia . تراوحت النسبة المئوية للسكريات الكلية ما بين ١٦.٢٨% للصنف سلطانين Sultanine إلى ١٨.٨% للصنف Italia . بينما تراوحت النسبة المئوية للسكريات الأحادية ما بين ١٣.٤٨% للصنف Danlas إلى ١٧.٦٥% للصنف . Sultanineأظهرت النتائج بصفة عامة ، أن هذه الأصناف تتميز بخصائص فينولوجية نموذجية مرضية أثناء مرحلة النمو وعند النضج ، مما يدل على تأقلمها مع الظروف البيئية لمنطقة (مسة) – البيضاء – ليبيا.